

The Examiner rejected claims 1-6, 9-11, 13-14, and 16-18 under 35 U.S.C. §103(a) as being unpatentable over Somaki *et al.* (5,641,113) in view of Akamatsu *et al.* (5,611,481).

The Examiner rejected claims 7-8, 12, and 15 under 35 U.S.C. §103(a) as being unpatentable over Somaki in view of Akamatsu as applied to claims 1-6, 9-11, and 13-14 above, and further in view of Thomas (6,213,347).

Applicants respectfully traverse the 35 U.S.C. §103 rejections with the following arguments.

35 U.S.C. §103

The Examiner alleges that “Somaki discloses an electrical structure, comprising: a first substrate comprising a chip (Fig. 2A-3 el. 11; col. 4 lines 4-5); a first conductive body comprising a solder bump (el. 13a; col. 5 lines 1-2) coupled to said first substrate; an epoxy material (el. 14; col. 5 lines 15-21) that volumetrically surrounds and contacts a first portion of a surface of said first conductive body such that a second portion of the surface of said first conductive body is not contacted by said epoxy material (Fig. 2D); a second conductive body (el. 13b) coupled to said first conductive body at said second portion; and a second substrate comprising a circuit card (el. 20; col. 6 lines 59-61) coupled to said second conductive body; wherein a height of said second conductive body is at least 50% of a height of said solder bump (Fig. 2E), and wherein an area of said first portion exceeds an area of said second portion by a factor of about 10 (Fig. 2D), and wherein a height of said second conductive body is at least 3 mils (col. 6 lines 31-34). Somaki also discloses an epoxy material (el. 34) applied to the second layer of conductive bodies, which implies that said epoxy material could be equally applied to the

second or top layer of conductive bodies which are coupled to the second substrate (col. 5 lines 38-42; col. 8 lines 15-17)."

The Examiner also alleges that "[h]owever, Somaki does not disclose a second conductive body whose melting point is less than a melting point of said first conductive body. Akamatsu discloses a flip chip device wherein the chip is coupled to the substrate using two stacked layers of conductive bodies wherein the melting point of one conductive body exceeds the melting point of a second conductive body by no more than about 147 degrees C (col. 4 lines 4-16). Therefore, it would have been obvious to a person skilled in the art at the time of the invention to use the conductive bodies of different melting points of Akamatsu with the electrical structure of Somaki in order to avoid repellency of molten soldering metal by the electrode surface, and thereby reduce electric resistance and increase mechanical strength of the connection (Akamatsu - col. 4 lines 17-27)."

The Examiner further alleges that "Akamatsu also discloses a eutectic lead/tin ratio conductive body and a lead/tin ratio conductive body that exceeds a eutectic lead/tin ratio (col. 4 lines 4-16); and a ceramic substrate (col. 5 lines 25-31)."

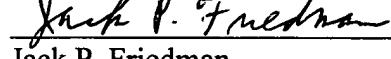
Applicants respectfully contend that claims 1 and 18 are not unpatentable over Somaki and Akamatsu, because Somaki and Akamatsu do not teach or suggest each and every feature of claims 1 and 18. For example, Somaki and Akamatsu do not teach or suggest "wherein the nonsolderable and nonconductive material is continuously distributed between the first conductive body and the third conductive body." Based on the preceding arguments, Applicants

respectfully maintain that claims 1 and 18 are not unpatentable over Somaki and Akamatsu, and that claims 1 and 18 are in condition for allowance. Since claims 2-17 and 40 depend from claim 1, Applicants contend that claims 2-17 and 40 are likewise in condition for allowance. Since claim 41 depends from claim 18, Applicants contend that claim 41 is likewise in condition for allowance.

CONCLUSION

Based on the preceding arguments, Applicants respectfully contend claims 1-18 are in condition for allowance. If the Examiner believes that anything further is necessary in order to place the application in better condition for allowance, the Examiner is requested to contact Applicants' undersigned representative at the telephone number listed below.

Respectfully submitted,



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Appendix A. Identification of Amended Material

In the Specification, please amend the paragraph beginning on page 35, line 7 as follows:

FIGS. 23-28 illustrate process steps associated with a fourth embodiment of the present invention. FIG. 23 shows the first structure **10** of FIG. 1 such that the coat of material **18** of FIG. 1 is replaced by the volume of material **19** of FIG. 23. The volume of material **19** of FIG. 23 may include any material (e.g., a nonsolderable and nonconductive material such as a polyimide or a photosensitive resin) that could be included in the coat of material **18** of FIG. 1, or additionally epoxy adhesive or silicone adhesive. The first substrate **12** (e.g., chip, module), first conductive bodies **14** (e.g., solder bump such as C4 solder ball), and pads **16** in FIG. 23 are the same as in FIG. 1. All processes, materials, etc. described *supra* for FIG. 1 apply to FIG. 23 except for differences attributable to the geometrical difference between the volume of material **19** of FIG. 23 and the coat of material **18** of FIG. 1. The volume of material **19** is said to volumetrically surround the conductive bodies **14**. As seen in FIGS. 23-28, the volume of material **19** is continuously distributed between the two first conductive bodies **14** shown in FIGS. 23-28, and the volume of material **19** fills a space between the two first conductive bodies **14** shown in FIGS. 23-28.

Please amend claims 1 and 18 as follows:

1. (AMENDED) An electrical structure, comprising:
 - a first substrate;
 - a first conductive body mechanically and electrically coupled to the first substrate;

a third conductive body mechanically and electrically coupled to the first substrate;
a nonsolderable and nonconductive material, wherein the nonsolderable and
nonconductive material volumetrically surrounds and contacts a first portion of a surface of the
first conductive body such that a second portion of the surface of the first conductive body is not
contacted by the nonsolderable and nonconductive material, wherein the nonsolderable and
nonconductive material volumetrically surrounds and contacts a first portion of a surface of the
third conductive body such that a second portion of the surface of the third conductive body is
not contacted by the nonsolderable and nonconductive material, and wherein the nonsolderable
and nonconductive material is continuously distributed between the first conductive body and the
third conductive body;

a second conductive body mechanically and electrically coupled to the first conductive
body by surface adhesion [at] between a surface of the second conductive body and the second
portion of the surface of the first conductive body, wherein a melting point of the second
conductive body is less than a melting point of the first conductive body; [and]

a fourth conductive body mechanically and electrically coupled to the third conductive
body by surface adhesion between a surface of the fourth conductive body and the second portion
of the surface of the third conductive body, wherein a melting point of the fourth conductive
body is less than a melting point of the third conductive body; and

a second substrate mechanically and electrically coupled to both the second conductive
body and the fourth conductive body.

18. (AMENDED) An electrical structure, comprising:

a first substrate;

a first conductive body mechanically and electrically coupled to the first substrate;

a third conductive body mechanically and electrically coupled to the first substrate;

a nonsolderable and nonconductive material, wherein the nonsolderable and nonconductive material volumetrically surrounds and contacts a first portion of a surface of the first conductive body such that a second portion of the surface of the first conductive body is not contacted by the nonsolderable and nonconductive material, wherein the nonsolderable and nonconductive material volumetrically surrounds and contacts a first portion of a surface of the third conductive body such that a second portion of the surface of the third conductive body is not contacted by the nonsolderable and nonconductive material, and wherein the nonsolderable and nonconductive material is continuously distributed between the first conductive body and the third conductive body;

a second conductive body, wherein a melting point of the second conductive body is less than a melting point of the first conductive body;

means for mechanically and electrically coupling the second conductive body to the first conductive body by surface adhesion [at] between a surface of the second conductive body and the second portion of the surface of the first conductive body[, wherein said coupling means includes means for applying a temperature to the first conductive body and the second conductive body, wherein the temperature is below a melting point of the first conductive body, and wherein the temperature is not below a melting point of the second conductive body]; [and]

a fourth conductive body, wherein a melting point of the fourth conductive body is less than a melting point of the third conductive body;

means for mechanically and electrically coupling the fourth conductive body to the third conductive body by surface adhesion between a surface of the fourth conductive body and the second portion of the surface of the third conductive body; and

a second substrate mechanically and electrically coupled to both the second conductive body and the fourth conductive body.